

Chapter 5

Polynomials

1. What is the simplified form of $\left(\frac{3}{2}\right)^{-3}$?

A. $\frac{6}{9}$

B. $\frac{8}{27}$

C. $-\frac{9}{6}$

D. $-\frac{27}{8}$

$$\frac{3^{-3}}{2^{-3}} = \frac{2^3}{3^3} = \frac{8}{27}$$

2. Simplify the expression $\frac{p^3 q^{-2}}{(pq^2)^{-3}}$.

$$\frac{p^3 q^{-2}}{p^{-3} q^{-6}} = p^6 q^4$$

3. Let $a = (4.5 \times 10^7)$ and $b = (6.0 \times 10^9)$. Write the value of each expression in scientific notation.

a. ab

$$27 \times 10^{16}$$

$$2.7 \times 10^{17}$$

b. $\frac{a}{b}$

$$.75 \times 10^{-2}$$

$$7.5 \times 10^{-3}$$

4. The simplified form of the expression $(2^n ab)^2$ is $\frac{a^2 b^2}{16}$. What is the value of n ?

A. $\frac{1}{8}$

B. $\frac{1}{4}$

C. -2

D. -8

7. Evaluate each expression when $x = 2$.

a. $f(x) = 3x^3 + 2x^2 - 5x + 6$

$$f(2) = 3(2)^3 + 2(2)^2 - 5(2) + 6$$

$$f(2) = 28$$

b. $g(x) = x^4 - 7x^2 + 6x$

$$g(2) = 2^4 - 7(2)^2 + 6(2)$$

$$g(2) = 0$$

9. Find the products.

a. $(2a - 5b)^2$

$$(2a - 5b)(2a - 5b)$$

$$4a^2 - 20ab + 25b^2$$

b. $(3y + 2)^3$

$$(3y + 2)(3y + 2)(3y + 2)$$

$$(9y^2 + 12y + 4)(3y + 2)$$

$$27y^3 + 18y^2 + 27y^2 + 24y + 12y + 8$$

$$27y^3 + 45y^2 + 36y + 8$$

c. $(4xy + 7)(4xy - 7)$

$$16x^2y^2 - 49$$

11. The function $f(x) = x^6 - 2x^4 + x^3 - 5x^2 - k$ is graphed on a coordinate grid.

a. Describe the end behavior of the graph of this function.

positive and even

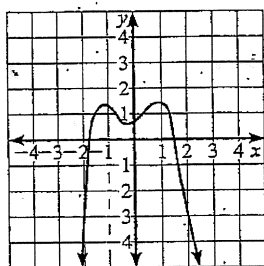
right: rises

left: rises

b. At most, how many turning points might this function have?

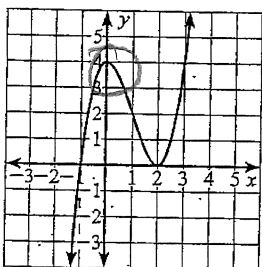
$$6 - 1 = 5 \text{ turns}$$

12. In the graph shown, what must be true of the function's degree and leading coefficient?



falls

- A. The degree is even and the leading coefficient is positive.
 B. The degree is even and the leading coefficient is negative.
 C. The degree is odd and the leading coefficient is positive.
 D. The degree is odd and the leading coefficient is negative.
14. In the graph shown, which of the following functions could be represented by the graph?



2 turns
 right rises → positive
 left falls → odd

- A. $f(x) = x^3 + 3x^2 - 2$
 B. $f(x) = x^3 - 3x^2 + 2$
 C. $f(x) = x^3 + 3x^2 - 4$
 D. $f(x) = x^3 - 3x^2 + 4$

For Exercises 16–18, factor the polynomials completely.

16. $(x^3 - 5x^2) + (2x - 10)$

$$x^2(x-5) + 2(x-5)$$

$$(x^2+2)(x-5)$$

17. $3y^4 - 24y$

$$3y(y^3 - 8)$$

$$3y(y-2)(y^2+2y+4)$$

18. $32x^6 - 50$

$$2(16x^6 - 25)$$

$$2(4x^3 - 5)(4x^3 + 5)$$

19. Factor $f(x) = x^4 - 13x^2 + 36$ completely, given that $x - 3$ and $x + 2$ are two of the factors.

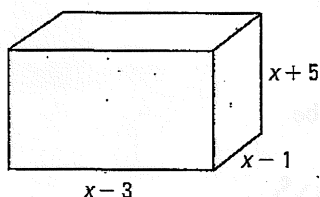
$$\begin{array}{r|rrrrr} 3 & 1 & 0 & -13 & 0 & 36 \\ & \downarrow & 3 & 9 & -12 & -36 \\ \hline & 1 & 3 & -4 & -12 & 0 \end{array}$$

$$(x^2 + x - 6)(x - 3)(x + 2)$$

$$(x + 3)(x - 2)(x - 3)(x + 2)$$

$$\begin{array}{r|rrrr} -2 & 1 & 3 & -4 & -12 \\ & \downarrow & -2 & -2 & 12 \\ \hline & 1 & 1 & -6 & 0 \end{array}$$

23. The volume of the box below is 80 feet³.



What are all the possible values of x ?

A. 5

B. 8

C. ~~5~~, -5

D. ~~8~~, ~~8~~

$$(x + 5)(x - 1)(x - 3) = 80$$

$$(x^2 + 4x - 5)(x - 3) = 80$$

$$x^3 + x^2 - 17x + 15 = 80$$

$$x^3 + x^2 - 17x - 65 = 0$$

24. What are the real-number solutions to the equation below?

$$w^4 + 4w^3 + 12w = 2w^2 + 15$$

$$w^4 + 4w^3 - 2w^2 + 12w - 15 = 0$$

$$\pm 1 \pm 3 \pm 5 \pm 15$$

$$1, -5$$

$$\begin{array}{r|rrrrr} 1 & 1 & 4 & -2 & 12 & -15 \\ & \downarrow & 1 & 5 & 3 & 15 \\ \hline & 1 & 5 & 3 & 15 & 0 \end{array}$$

$$\begin{array}{r|rrrr} -5 & 1 & 5 & 3 & 15 \\ & \downarrow & -5 & 0 & -15 \\ \hline & 1 & 0 & 3 & 0 \end{array}$$

$$(x - 1)(x + 5)(x^2 + 3) = 0$$

$$x = 1$$

$$x = -5$$

$$x^2 + 3 = 0$$

$$x^2 = -3$$

$$x = \pm i\sqrt{3}$$